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Weather in Relation to Pressure Distribution, September, 1924 to February, 1925

By C. E. P. BROOKS, M.Sc.

THE autumn of 1924 and the winter of 1924 to 1925 have been characterised in the British Isles by a continuance of the wet weather of the summer. The monthly percentages of normal published in the *Meteorological Magazine* are as follows:—

	1924-1925.				
	Sept.	Oct.	Nov.	Dec.	Jan.
England and Wales ..	174	132	86	124	107
Scotland	173	97	68	125	106
Ireland	217	97	103	140	114
British Isles	183	115	85	127	108

The worst weather was experienced in Ireland and the best in Scotland; September and December, 1924, were months with outstanding amounts of rain.

In considering the relation of the weather to pressure distribution it was found* that during the three months, April to June, 1924, there was a broad belt with pressure below normal extending across the North Atlantic in about 50°N, crossing the British Isles and including Scandinavia and the Baltic, and that in July and August this belt was replaced by an area with pressure more than 5 mb. below normal, centred near Thorshavn and covering a large part of the British Isles. It has now to be stated that in September this type of pressure distribution reached its maximum intensity; pressure was 10 mb. below

Meteorological Magazine, vol. 59, September, 1924, p. 178.

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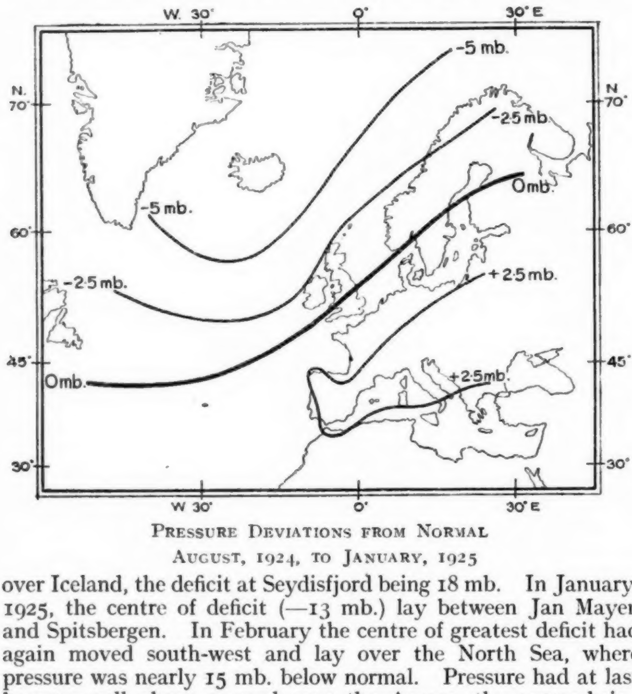
normal at Stornoway and more than 5 mb. below normal over the whole of the British Isles. After September the centre of pressure deficit moved slowly north-westwards; in October it lay over Iceland and in November probably over South Greenland. In the latter month the pressure over the North Sea was well above normal, giving England the first relatively dry month which it has enjoyed since March. In December, however, this pressure excess had moved away to central Europe, and the British Isles were again dominated by a deep low-pressure area



PRESSURE DEVIATIONS FROM NORMAL
AUGUST, 1924, TO JANUARY, 1925

over Iceland, the deficit at Seydisfjord being 18 mb. In January, 1925, the centre of deficit (—13 mb.) lay between Jan Mayen and Spitsbergen. In February the centre of greatest deficit had again moved south-west and lay over the North Sea, where pressure was nearly 15 mb. below normal. Pressure had at last become well above normal over the Azores, the excess being 10 mb. at Horta and 6 mb. in 50°N, 30°W.

Throughout the period pressure appears to have been relatively low over the North Atlantic west of the British Isles. The average conditions for the six months August, 1924, to January, 1925 (figure I.), show a deep trough of pressure below normal extending from Spitsbergen across Iceland to the oceanic region west of Ireland. During most of the period pressure remained

above normal over southern and central Europe. The normal pressure difference during August to January between Zürich in Switzerland and Reykjavik in Iceland is 15·6 mb.; during the period under review the difference was 26·1 mb. The pressure distribution was very favourable to persistently strong and stormy winds from between south and south-west, and these winds gave their character to the past six months.

In the article which has been referred to the belt of low pressure across the Atlantic in April to June was attributed chiefly to the reversal of the normal pressure gradient between Newfoundland and southern Greenland in January to March, which hindered the free outflow of the cold Labrador current. Pressure continued relatively low over Newfoundland, and high over Iceland until the end of June (map, page 180, September, 1924), thus tending to maintain low pressure over the British Isles until the end of September.

In explanation of the continuance of the low pressure over the North Atlantic through the winter it may be noted that one of the most striking anomalies of the pressure distribution of 1924 was the remarkably low pressure (10 mb. below normal) over the Azores during March and April.* Associated with the north-east trade wind there is usually a fall of pressure from the Azores to the coast of Africa. In March and April, pressure at Horta is normally 9 mb. above that at Sierra Leone, but in 1924 it was 1 mb. below, so that south-west winds must have replaced the north-east trade winds in this region. Now correlation of the trade-wind velocity (calculated from the pressure differences between the Azores, Gibraltar and Sierra Leone) with subsequent pressure in western Europe and the North Atlantic has shown that an abnormally weak or reversed trade wind is followed after the lapse of 6 to 9 months by low pressures in southern Greenland, Iceland, the Faroes and northern Norway, and by high pressures in the Azores. The sequence of events is that the reduction in the strength of the trade winds is accompanied by a reduction in the drift of warm water into the Caribbean Sea and north-eastwards in the Gulf Stream, so that the surface waters of the Norway-Greenland Sea become cooler than usual and the contrast in temperature between the ocean near the Azores and near Spitsbergen is accentuated. On these lines we obtain a partial explanation of the anomalies of the pressure distribution from September, 1924, to January, 1925; only partial, for the trade wind effect is probably not sufficient to account for the whole of the actual pressure deficit in the region between Greenland and Spitsbergen. Moreover, the course followed by the pressure isanomaly of —5 mb. suggests that there was abnormally high temperature and small ice-development in the East Greenland

*Meteorological Magazine, vol. 59, May, 1924, p. 79.

current and the temperature of this current would not be affected by the Gulf Stream. Thus in explanation of the pressure distribution that produced the wet spell from which we have suffered during the winter we have two factors, one of which has been traced back to its origin in the spring, when the trade wind circulation was weak ; the origin of the other, the supposed lack of ice in the East Greenland current, has not been connected with previous weather. It is important to notice that these factors, or at any rate the former, came into operation just as the effect of the inhibition of the Labrador current was dying away so that our south-westerly weather persisted with hardly a break.

OFFICIAL NOTICE

A new division of the Meteorological Office, the Airships Meteorology Division, has been formed to carry out meteorological work in connection with Imperial Airship routes. Mr. M. A. Giblett, assistant superintendent of the Forecast Division, has been promoted acting superintendent in charge of the new division.

OFFICIAL PUBLICATIONS

The following publications have recently been issued :—

Hygrometric Tables for the computation of Relative Humidity, Vapour Pressure and Dew Point from readings of Dry and Wet Bulb Thermometers exposed in Stevenson Screens (No. 265).

These tables, which have been computed on the basis of Regnault's moderate wind formula, have been prepared by the Meteorological Office, and will be brought into use for the preparation of data for publication as from January 1st, 1926. The tables are arranged for temperatures in Fahrenheit degrees, and vapour pressures in millibars, and they have been computed for a mean atmospheric pressure of 1,000 millibars. They are conveniently arranged to give in one " opening " the relative humidities, the vapour pressures and the dew points corresponding with a given range of temperatures of the dry bulb and of " depressions of the wet bulb."

PROFESSIONAL NOTES.

No. 38. *The Measurement of Upper Wind Velocities by Observations of Artificial Clouds.* By C. D. Stewart, B.Sc. (No. 245r).

This paper gives the theory and practical details of the method

of obtaining upper wind velocities from observations of artificial clouds. A tracing of the apparent path of a cloud is made in ink on the surface of a mirror and from the length of the trace the wind velocity, at the height of the cloud is computed by the use of a table of factors given in the text. The method was first used with shell bursts during the war, but the paper describes how it has been extended to include observations of clouds discharged from aeroplanes. Tables are given to enable the pilot to correct his height for any readings of his altimeter and thermometer. The method is extremely simple in use.

No. 39. *The Upper Air Circulation of the Atlantic Ocean.* By E. W. Barlow, B.Sc. (No. 245s).

Part I. of this paper gives an historical account of the various series of observations of temperature, humidity and upper wind currents made over the Atlantic Ocean chiefly by means of kites and pilot balloons. In Part II. the present state of our knowledge of the air circulations over the ocean is set out, and the relation of the trade winds, the counter-trades, and the eastern equatorial current is shown. Part III. deals with the meteorological aspects of Atlantic flying, including the frequency of sea-fog and of the conditions which create " bumpiness."

Discussions at the Meteorological Office

March 2nd, 1925. *Wellen und Wirbel an einer quasistationären Grenzfläche über Europa.* By T. Bergeron and G. Swoboda. (Veröff Geophys. Inst., Leipzig, 2 Ser., Bd. III., H. 2). *Opener*—Major A. H. R. Goldie.

In this paper the authors have made a close study of all the available observations for 6 days and have traced the oscillations of the boundary between a warm and cold current of air flowing side by side from the Atlantic to Central Europe. These oscillations were manifested as secondaries to a large cyclone which itself was drifting eastwards. The last of the secondaries itself developed into a cyclone. The evidence is clear that the cyclone did originate from the pre-existing discontinuity in the airflow. Until recently many meteorologists were inclined to look for the cause of cyclones in the behaviour of the upper currents ; such cases as this demonstrate that the causes are nearer at hand. A difficult paper but very important.

Royal Meteorological Society

The monthly meeting of this Society was held on Wednesday, February 18th, at 49, Cromwell Road, South Kensington,

Capt. C. J. P. Cave, M.A., President, in the Chair.

Dr. Th. Hesselberg, Director of the Norwegian Meteorological Service, and Prof. J. Maurer, Director of the Swiss Meteorological Service, were elected Honorary Members of the Society.

L. D. Sawyer, B.A.—The Effect of Pressure Distribution upon London's Sunshine in Winter.

The amount of sunshine in London is determined partly by meteorological conditions, partly by the fouling of the atmosphere by smoke. In this paper, South Farnborough, some 30 miles to the southwest, is taken as the "control" station with a comparatively clean atmosphere. It is found that SE winds give South Farnborough about 4 hours sunshine a day in winter, whilst NE winds are the worst with only ¾ hr. The SE wind is cold and dry and has come for a great distance over land. The NE wind on the other hand has picked up moisture in its passage over the North Sea and it brings to London a uniform canopy of cloud. (It is also a smoky wind at South Farnborough, so that the records at the control station must be adversely affected to a certain extent). Whatever the wind direction, smoke deprives the average London station of a third of its sunshine, *i.e.*, the heating power of the sunshine is so far reduced that the number of hours during which a sunshine card is scorched is cut down by one third. The central stations and those to leeward for the particular wind lose a half, whilst the windward stations are not affected by the smoke. Miss Sawyer's investigations cover only five recent winters. The desirability of working up earlier records was brought out in the discussion. There has probably been a considerable improvement in the period which has elapsed since the sunshine recorders were set up about 1880.

Prof. S. Chapman, F.R.S.—On the Changes of Temperature in the Lower Atmosphere, by Eddy Conduction and otherwise.

It has long been recognised that the daily variation of temperature is due in the main to the heating of the atmosphere by the ground. The process is not completely understood, however. The temperature records which are kept at various heights on the Eiffel Tower provide material for investigating the flow of heat from one level to another. The material has been utilised by G. I. Taylor and by W. Schmidt. Professor Chapman is not satisfied that the results obtained by these workers tell the whole story and he has made a closer analysis of the statistics. He finds that "eddy conductivity," the only agency considered by Taylor, will only account for half the heat which reaches the upper levels. The conclusion is that radiation plays a more important part than had been suspected. It was urged in the discussion that the methods adopted in the paper did not take

account of convection. However that may be, it is clear that there is room for further study of the familiar phenomena of the daily temperature change. Meteorologists have reason to regret that the Watkin Tower which was started at Wembley some forty years ago was never completed to give us English observations comparable with the French ones. It was, therefore, interesting to learn (in the discussion) that we are soon to have records which will serve the same purpose from instruments at the great wireless station at Leafield.

N. K. Johnson, M.Sc., and O. F. T. Roberts, B.A.—The Measurement of the Lapse Rate of Temperature by an Optical Method.

The refraction of light as it passes over cold or warm ground is a bugbear of surveyors. It was suggested in the *Meteorological Magazine* in 1920 that the phenomenon might be turned to good account as giving a measure of the variation of temperature with height. The authors of this paper set up scales at different distances from a telescope and observed how the apparent height of the graduations varied under different conditions. Their conclusion is that the "lapse-rate" of temperature can be determined with considerable accuracy, so that it will be possible to utilise the method in the study of the interchange of heat between ground and air, the problem of the preceding paper.

Correspondence

To the Editor, *The Meteorological Magazine*

Drought in Western Anatolia

For the past three months the western end of Asia Minor has been suffering conditions of drought. Local residents remember no such drought since 1890 but regular weather records in this region do not date back that far. Good rains invariably fall in the autumn, that is to say, about November. At this time of the year they are intermittent, but towards the end of December and during January and part of February they are practically continuous. March rains are intermittent and from the beginning of April they usually cease. A few heavy downpours may come between April and September but they are few and far between if they come at all. The "winter rains" are of especial importance to the farmers, for cereal crops are usually planted immediately after the first autumn rains and depend on the later rains for proper growing conditions. Tobacco and cotton crops are planted after the March rains, but depend upon a well-watered and prepared soil.

The table below gives (*a*) the average rainfall (1907-1912) for the rainy season according to the Admiralty and War Office

Handbook, I.D. 1117, on the Climate of the Eastern Mediterranean; (*b*) the average rainfall according to records kept at the International College, Smyrna, from 1902 to 1925; and (*c*) a record of the rainfall of 1924-25 rainy season, for comparison:—

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total.
	in.	in.	in.	in.	in	in.	in.
(*a*) ...	0·52	0·81	3·36	3·72	2·79	2·61	13·81
(*b*) ...	0·31	1·81	3·67	4·37	4·28	3·05	17·49
(*c*) ...	0·0	1·78	2·15	0·01	0·00	1·10	5·04

To express the same statistics in another way, the table below states (*a*) the average number of rain-days in Smyrna, according to the Admiralty and War Office Handbook I.D., 1117, and (*b*) the record of this year's rainy season in rain-days:—

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total.
(*a*) ...	2·5	3·0	10·3	11·1	10·8	10·6	48·3
(*b*) ...	0	9	7	1	0	7	24

The weather during this period was variable between extreme cold caused by bitter north-east winds during December and part of January, and unusual heat in the latter part of January and throughout February. At present the days are hot, the ground is baked, the streams are dry. Fruit prospects, especially raisins and figs, are discouraging, and the cereal crops will probably be complete failures. Agriculture generally will be seriously injured this year. Already plans are being laid for a famine relief campaign next summer; for the chronic wheat shortage will be severely accentuated by the failure of crops.

The drought reaches along the western coast to Cilicia and the Adana district, and influences the whole littoral lowlands. In the interior, however, in the mountainous table-lands, an unusually severe winter has been experienced with deep snows of several feet in depth.

KENNETH P. KIRKWOOD.

International College, Smyrna, Turkey. March 1st, 1925.

A Great Hailstorm, Windsor Park, March 1st, 1925

A thunderstorm by which I was detained nearly two hours at Virginia Water on the afternoon of March 1st was of extraordinary violence for so early a date, inasmuch as it was emphatically of the summer type—protracted, slow moving, with inky blackness and absence of wind. Cars coming from the direction of Sunningdale were laden with hail, and later in travelling by bus to Windsor, and thence by train to London, I passed through two strips of hail-stricken country, where it lay thick on the roads and fields, one at the edge of the Great Park, and another close to Slough. People called it "snow" but it was a genuine case, in the main at all events, of thunderstorm hail.

In the morning masses of cumulo-nimbus, some with "anvils," began to develop almost as soon as an early fog dispersed, but it was not until about 1 p.m. that I definitely noticed the nucleus of the coming storm, which appeared to grow, in part at least, *in situ*. I carefully verified that on the southern periphery of this nucleus low clouds were moving from the west, and on the northern periphery from the east, whilst on the east side they appeared to be drifting from south, though in this case I may possibly have been deceived by perspective. This suggests, in fact almost demonstrates, a distinct if weak cyclonic circulation round the growing storm centre. From this apposition between a westerly and an easterly current, and from previous experience of spring thunderstorms of this type being the precursor of a spell of bitter east wind, I felt almost sure that the wind over south-east England next day would be east, a prediction which was amply fulfilled.

There were evidently a combination of factors necessary for the production of this storm. In the first place we had polar air on March 1st with probably a very low upper air temperature; in the second place the strengthening equinoctial sunshine was decidedly powerful in the forenoon and this must have engendered a steep lapse-rate; and thirdly, perhaps the most important factor of all, there was the conflict of air currents associated with the change from a westerly to an easterly type of weather.

A thunderstorm of this violent type struck me as peculiarly impressive at a time of year when Windsor Forest was looking so bleak and bare.

L. C. W. Bonacina.

27, Tanza Road, Hampstead, N.W. 3. March 4th, 1925.

Localised Precipitation

February 13th and 14th furnished a notable example of the complex weather conditions that have prevailed throughout the month.

> 13th. After an overcast morning with sleet, the sky cleared gradually soon after 10h. and became perfectly clear. There was no wind. Late at night there were 12° of frost (on the grass). During the night rain set in.
>
> 14th. Overcast and wet; then sleet; no wind till 14h. when it began to blow strongly from the west; from 16h. 30m. to 18h. 30m. a snowstorm; sleet all night.
>
> 15th. Sleet with SSE wind; 10h. 30m. rain with SW wind; 14h. sky cleared in the south, rain ceased; 16h. 15m. rain began again.

From Friday night, the 13th, till Sunday 15th, 2 p.m., precipitation never ceased. The barometer was very low the whole of the 3 days, falling on Saturday slightly—but rising on Sunday. On Sunday, the 15th, a young friend of mine came

here from Hexham on a bicycle. He had been in Newcastle on Saturday from 5 p.m. till midnight and it was quite fine. On Sunday he left Hexham about 9 a.m. with genial sunshine, dry roads and a light following SE breeze and had no thought of anything else till he ran into it about 12 miles from here. The last 10 miles he had ridden in soaking sleet, ploughing through inches of snow and slush.

A. J. DEXTER.

Falstone Rectory, Northumberland. March 2nd, 1925.

Rainfall of very Rare Intensity

I have been invited to write a criticism of the Article "On Rainfall of very Rare Intensity," compiled from official records by Mr. F. J. W. Whipple.* In so far as it contains the results of one instrumental and two estimated records, there is, of course, nothing to criticise, and in the considerations which I am now putting forward I have no desire to impugn the *bona fides* of anyone whose experiences may not have coincided with my own. My only desire is to contribute something to the solution of a problem which is admittedly of considerable practical importance, and one which it is no exaggeration to say has never been seriously studied. With regard to instrumental observations, it is somewhat surprising that Symons's Storm Gauge, if it was a success, has not continued in use. I know of no modern recording instrument which is not almost at once put out of action by really heavy rain, and it would appear that the Symons Gauge must have been open to further objections than those noted. From its construction the record cannot have been co-incident with the actual fall, for the rain is conducted away through a bent pipe into the vessel which contains the float, and the rise of the water in the vessel raises the float which actuates the mechanism. Now, unless this apparatus is kept at all times perfectly clean—a difficult matter in a dirty climate—the action of the float and its mechanism must tend to be jerky, and my suggestion is that a very great variation in the mean rate must be due to such a cause, if, which is by no means certain, the apparatus itself is in all respects well designed to record what it purports to record. The difficulty about apparatus of this sort is that it is only required to function on rare occasions, and it is almost impossible to ensure that it will function properly. The suggestion I put forward is that no apparatus has yet been designed, which is not "smothered" by heavy rain; this has certainly been my experience with all automatic recorders. If the Symons Storm Gauge was a success, why has it been relegated to a Museum?

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* *See Meteorological Magazine,* vol. 59, August, 1924.

And why cannot our modern designers give us a satisfactory Storm Gauge ?

Next as to the estimated records ; the report of the 2·90 in. in 30 minutes, admits enormous hailstones, which is hardly a fair criterion for rain. The total of 2·09 in. in 35 minutes is, of course, a heavy fall which was apparently unaccompanied by hail, but what is most surprising to me, with quite as many years' experience as an observer, is that anyone could venture to make such an estimate of the interim intensity, or that any such estimate should be accepted. With a greater experience of really intense rainfall than anyone whose observations have been confined to this country could hope to possess I say without hesitation that it is impossible to make an estimate of really intense rain with any approach to accuracy. I have proved instrumentally that the apparent intensity of rainfall is most deceptive, and I am willing to wager any observer who chooses to come forward that he will not estimate the next really heavy downpour within a wide margin, even as to the total fall.

I hope, in due course, to be allowed to bring forward certain negative evidence which establishes, in my submission, that there must be something very wrong with an estimate of a rate of 15 inches per hour for this country, and, as the evidence comes from an area of cyclonic storms far exceeding in intensity anything I have experienced in this country, it can only be open to the objection that it is not evidence relating to this country. I may say, in advance, that it is the result of several years observations especially directed to this question, and contains no estimates whatever.

F. J. VARLEY.

4, Lansdowne Crescent, London, W.11. March 2nd, 1925.

Types of Mammillated Clouds

SOME little time ago correspondence appeared in *Nature* regarding mammato-cumulus and its mode of formation. Mammillated clouds are seen rather frequently in Australia and especially, perhaps, at Melbourne. Two types of occurrence are noted. In the first the mammillation appears beneath a portion of the general cloud mass in front of the trough of a depression, the cloud being alto-cumulus or alto-stratus (about 2 km. to 5 km. high) approximating to nimbus. The second is in the unstable region in the rear of the trough of a depression and associated with the flanks or rear of cumulo-nimbus. In these cases, hail often falls from the cumulo-nimbus.

On two occasions, however, I have seen the mammato form developed in cirrus cloud and, as I have not seen this described elsewhere, it is perhaps worth recording. On the first occasion, November 30th, 1921, the mammillations appeared in two

separate masses of cirro-stratus seen low down and in profile. From the level strata of the cirro-stratus, the mammillations depended like inverted balloons and were the most symmetrical and perfect in shape of any I have seen. In colour they were the pale white typical of cirro-stratus. The cloud was moving from the west-south-west, and the region was in the rear of a depression.

On the second occasion, the mammillations were seen almost overhead, again in two masses of cirro-stratus, moving this time from the north-west. Being seen in plan and having the tenuity of cirrus cloud, they were much less striking than on the first occasion. Furthermore, they lasted for a minute or two only. The date was December 5th, 1924, and Melbourne was on the south-eastern side of a tropical depression. The temperature was high and rising and the insolation intense. Much of the cirro-stratus visible showed strongly developed cumuliform tops, and later in the day there were thundershowers and a change to southerly winds as the trough of the depression passed. It is suggested that a large scale uplift of the type characteristic of the centre of a depression caused rapid condensation at the cirrus level in a mass of air which had been brought to an unstable condition by surface heating over the continent : that, in consequence, precipitation took place : that the falling particles owing to their low temperature and through evaporation cooled the layers beneath the cloud which thereby became denser than their surroundings and commenced to fall. A similar explanation may frequently apply to the formation of mammato-cumulus. The dryness of the air in Australia probably accounts for the effect being visible so frequently, as under moister conditions it would be obscured by rain.

EDWARD KIDSON.

Meteorological Bureau, Melbourne. December 16th, 1924.

Lunar Rainbow and Eclipse

IT must be a rare occurrence for a Lunar Rainbow and an Eclipse to follow one another but such was the case here on February 8th. Though a westerly gale was blowing and small detached clouds raced across the sky the visibility was exceptionally good. On coming out of church at 19h. 30m. a lovely lunar rainbow was seen in the west, the colours being quite distinct. It was wonderfully stable and remained for at least an hour, waning away and then brightening again from time to time, and lasting, I believe, till the beginning of the eclipse, for which the conditions were ideal.

R. P. DANSEY.

Kentchurch Rectory, Hertford. February, 1925.

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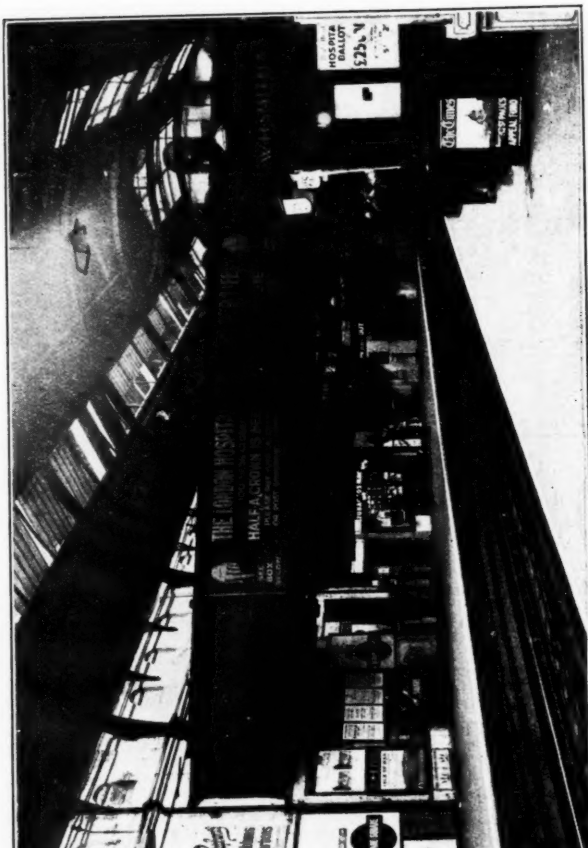


Sloane Square Station

NOTES AND QUERIES

A Course of Training for Observers

IT is proposed to hold a third general course of training for meteorological observers at Kew Observatory, Richmond, Surrey, during the week April 27th to May 2nd, 1925, both dates inclusive, provided that a sufficient number of applications are received.

The subjects to be dealt with will include the following :—

Meteorological instruments and method of Observation.

Recording of Observations and their transmission to the Meteorological Office.

The Weather Map ; charting of observations distributed by wireless telegraph.

Climatology.

The course is addressed primarily to observers at stations which report regularly to the Meteorological Office. Others will, however, be admitted, at the discretion of the Director, as far as the accommodation permits. Applications for tickets of admission should be made to the Director, Meteorological Office, Air Ministry, Kingsway, W.C. 2. There will be no fee for the course.

The Lesson of the Grimy Bridge

LONDONERS are familiar with the little aqueduct which crosses Sloane Square Station and carries the outflow from the Serpentine. The aqueduct has an advertisement of the claims of the London Hospital on either side, and it is remarkable that one section of each advertisement has become grimy whilst the rest is comparatively clean. As will be seen from the photograph (which has been taken by the kind permission of the Metropolitan District Railway Company) the position in which the dirt occurs on the west side of the aqueduct is over the down line. The corresponding smear on the other side is over the up line. It is clearly suggested that as an electric train passes under a bridge the air pushed out of the way by the front of the train eddies back against the bridge. It might have been thought that the air carried along by friction in the direction of the train's motion would blow up against a bridge and leave its mark, but if this effect occurs at all, it is not so conspicuous as the other.

Is it superfluous to add that even apart from questions of aerodynamics the notices on the aqueduct deserve attention ?

The Rotor Ship

A NEW method for the propulsion of ships by wind has been invented by Herr Anton Flettner, and tried in Kiel Harbour. Use is made of the fact that when the wind blows past a cylinder which is rotating about a vertical axis, the resultant force has a large component at right angles to the wind. Flettner's boat has two rotating cylinders, drums 60 ft. high and 10 ft. in diameter and they are driven at 100 revolutions per minute by 9 horse-power motors. According to newspaper reports the trials have been successful, but whether an economical method of navigation will be evolved remains to be seen.

The principle of the experiment is well known: it explains the soaring flight of a golf ball. Professor V. Bjerknes has a pretty experiment in which the lash of a whip is given a few turns round a cardboard cylinder, the cylinder is placed on a table and flung forward by a jerk of the whip. The cylinder flies forwards, then upwards, and regains the starting point by a more or less circular course. Flettner's large scale illustration of this principle is of theoretical interest even if it never develops into a practical success.

Since the above note was written, the Buckau, which is propelled by the rotor system, has completed her voyage from Danzig to the Firth of Forth. During the first part of the journey, to Kiel, it was found impossible with a westerly head wind blowing to make more than 4 knots, but afterwards the speed increased to 7 knots.

The Meteorological Station at Jan Mayen

ONE of the familiar difficulties in the study of weather maps is lack of information about the precise nature of the surroundings of the stations. The exchange of such information was recommended by a resolution of the International Meteorological Conference at Utrecht, and many accounts have already reached the Meteorological Office. One of the most interesting is that for the Norwegian station on the lonely island, Jan Mayen. We learn that the island is dominated by a great mountain, Beerenberg, 8,300 ft. high. The summit is 9 miles to the north-east of the meteorological station, and the lower ridges afford shelter from winds from that side. It is found also that winds from the south-west, blowing towards the mountain, are reduced in strength as well as diverted. The observations of winds from south or from north-west can be relied on. It is mentioned that the cloud movements are at times so irregular that no direction of drift can be reported. The characteristic difficulty in the weather observations is the impossibility of distinguishing at times between snow falling from the clouds and snow brought

from the mountains by the wind. As to temperature, it is stated in the memorandum that with winds from the north the influence of the mountains ought to raise the temperature at the station by 2° to 4° F. It would be interesting to know on what observations this estimate is based.

A Device for Observing with the Theodolite at Night

In the *Geographical Journal*, December, 1924, Mr. E. A. Reeves describes a device for sighting a theodolite at night without crosswires or field illumination. By the use of half-silvered glasses two images of a star are formed, and when the two images are brought into coincidence the observer knows that the star is on the principal axis of the telescope. The device might perhaps be adapted for use at night in observations of the lanterns carried by pilot balloons.

North and South Winds Cancel

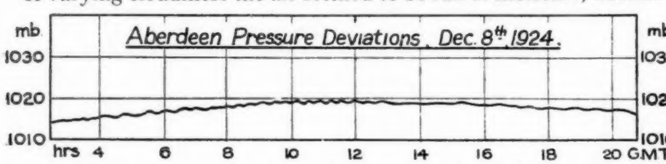
A sounding balloon sent up at Kew Observatory at 7h. 15m. (G.M.T.) on November 11th, 1924, fell at Woolwich Arsenal at 9h. 30m., having reached a height of 16·5 kilometers in the meantime. When the balloon left the Observatory it travelled towards the north-north-east, and when it was seen at Woolwich it was coming from the south. Clearly there must have been wind with a north component aloft. An almost exactly similar thing happened on December 4th, when a balloon sent up at Kew at 12h. 25m., fell in France after having reached about 14 kilometers. The run of the balloon in this case was 265 kilometers towards the south-east, and the pressure distribution almost exactly similar to that on the first occasion. A deep low south of Iceland and a high over Scandinavia caused a southerly wind over Kew and at the same time a shallow low existed over the Mediterranean. The balloon which fell in France appears not to have burst and therefore probably floated for some time before falling. These are examples of what is perhaps the most common type of reversal of wind direction. They occur when the air over the continent is cold compared with that over England.

L. H. G. D.

Drizzle under a Clear Sky

On December 8th, 1924, Mr. P. H. Jarrold observed at Aberdeen the occurrence of drizzle under a clear sky. During the afternoon the sky had been perfectly clear, except for a fog bank along the valley of the River Don. Quite suddenly, at about 17h. G.M.T., a sheet of stratus cloud spread rapidly from the south and covered

the whole sky. This broke up and cleared with similar rapidity about 17h. 15m. By 17h. 30m. patches of strato-cumulus, inclined to lenticular form, had appeared travelling rapidly from south-south-west. During the following half-hour, up to 18h., detached masses of lower cloud passed across the sky at a speed which, considering the quiet surface conditions, was somewhat unexpected. Thus, at one moment, the whole sky would appear overcast, while three or four minutes later the only clouds visible were the isolated patches of strato-cumulus. These alternations from fine to overcast occurred continuously for at least half-an-hour. The cloud masses were classified as stratus-cumuliformis, and had an appearance resembling "pancake-ice," the edges of the separate cloudlets, composing the mass, being sharply defined. The cloud was obviously very low. During this period of varying cloudiness the air seemed to be full of moisture, outside



objects were becoming distinctly wet, and the moisture could be felt on hands and face as if a slight drizzle was occurring: this continued during the periods of clear sky.* By 18h. 15m. the stratus had become thicker, and actual drizzle fell during the greater part of the evening.

During the period of observation the SSW surface wind was increasing, rising from force 2 to force 3 by 18h.: the temperature, which had been falling during the afternoon, had begun to rise again after 17h., and continued steadily rising until midnight: the relative humidity had been rising during the afternoon, but showed a sudden rise to 96 per cent. at 18h., continuing at that figure until midnight. At the time of Mr. Jarrold's observations a shallow secondary depression was approaching Aberdeen in a general south-westerly current. At 18h. there was drizzle at Leuchars, Renfrew and Eskdalemuir. There was a certain amount of temperature variability, but no well marked "front."

The photo-barogram for the day on which Mr. Jarrold's observations were taken is reproduced above. It shows a remarkably regular series of waves during the morning of the 8th which, however, died out before 14h. Irregularities in the trace also occurred during the evening. The observer at 9 h. noted that there was "Ci and Ci-St to Ci-Cu in places with waves."

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*It is not always remembered that as a rule the rain which reaches the ground has fallen from clouds which have already passed overhead.

Haze in the East Indies

THE valuable account of the climate of the Dutch East Indies, which is being published by Dr. C. Braak, has now reached Part 6.* This part includes a very interesting chapter on the "Transparency of the Air." As a general rule, transparency improves when rainfall is considerable, and on the other hand, haze increases in dry weather. In very dry years, the haziness is transformed into dense, gray fog. The worst year on record from this point of view, was 1902. Over large areas and for long periods the range of visibility was about a quarter of a mile. Navigation was conducted with great difficulty. These fogs are attributed mainly to the dust from the Australian deserts. Dr. Braak insists, however, on regarding them as affected to a great extent by the hygroscopic nature of the particles. He classes with the fogs of the East Indies gray haze observed over the Red Sea, where the number of hygroscopic particles shown by Aitken's dust-counter was small and the humidity rather low. "Apparently the dry air from the desert contains only a few, but probably very hygroscopic, particles, which increase considerably in dimensions under the influence of the rising relative humidity above the sea and form the gray fog." A more natural interpretation of the observations would seem to be that the non-hygroscopic particles form the haze. It is to be hoped that the Red Sea haze will be sampled with Dr. Owens's apparatus.

Is Lightning less dangerous in the Tropics?

Part 7 of the same publication contains some interesting statistics with regard to thunderstorms in the East Indies. The regularity of thunderstorms in the interior of Java is exemplified by the case of Buitenzorg, about 50 miles from Batavia and 800 ft. above sea level. The average number of days on which thunder occurs in the year is 322. In October and also in December the average number is 30·3. The storms always occur in the afternoon or early evening. Thunder is heard between 17h. and 18h. on 250 days a year.

In spite of the frequency of the storms the number of fatalities is remarkably low. With regard to material damage Dr. Braak writes :—

> "The cases of damage by lightning are in the Archipelago of less importance than in Europe, and it is for that reason more difficult to detect them. Cases of severe damage are rare, an exception being made by cinchona trees; these trees, however, are rather weakly built. Consequently the impression is given that cases of objects being struck by lightning are relatively rare. Careful examination, how-

*Het Klimaat Van Nederlansche-indie. Vol. I., Part 6 (with English Summaries). Koninklijk Magnetisch en Meteorologisch Observatorium te Batavia, Verhandelingen No. 8, Batavia, 1924

ever, discloses an unexpectedly large number of cases, which otherwise would be overlooked, and, in the end, one is led to the conclusion that the actual number is larger than in Europe, as is also the case with the number of thunderstorms themselves.

As an explanation of this relatively small damage, one could assume that the tropical trees are stronger, or that their conductivity is higher. To the writer, however, it appears that the facts are explained in a more satisfactory way by the assumption that it is the intensity of the lightning discharges which is different, and that the intensity is relatively small in the tropics. In that case we are induced, furthermore, to assume that the differences of electrical potential, which are necessary to cause a lightning flash, are relatively small, which in its turn might be explained by the assumption that in the tropics the conductivity of the air is relatively high."

As to the last sentence it may be remarked that according to G. Angenheister* the conductivity is five times as great at Samoa as in Berlin. This generalization applies however to fine weather ; it might or might not be true for thunderstorms.

Meteorology in the Ukraine

THE tide of meteorological publications from Russia, which was interrupted for some years by the war, has set in again with full vigour, but instead of emanating almost exclusively from the Central Physical Observatory, the reports now come from a number of local centres. We have recently received a number of publications from the Meteorological Service of the Ukraine, which is under the direction of M. Danylevski. These include copies of a monthly weather report, which was initiated in January, 1923, some sections of rainfall tables, and a meteorological magazine. The monthly weather report is admirable : it includes ten-daily means for all stations, daily observations *in extenso* at Kieff, Kharkov and Odessa, and daily observations in less detail for a selection of other stations. Sunshine is represented by heliographic observations at 21 stations, of which four are equipped with Campbell-Stokes recorders, and the rest with Velichka recorders. Among the observations, we notice that at Odessa in winter earth temperatures are taken both beneath the snow and beneath a patch of soil which is kept bare : in January, 1924, at a depth of 40 cm. (1·3 ft.), the former averaged +2·1° C., and the latter —5·2° C, the difference of 7·3° C. illustrating very effectively the power of snow to keep the soil warm. The rainfall tables cover varying periods between 1911 and 1922 : they are issued in sections relating to different parts

* *Gottingen Abh. Ges. Wis.*, Neue Folge, Band IX., Nro. 2.

of the country, but do not include rainfall maps. The monthly magazine, the title of which signifies "Informatory Bulletin of the Ukraine," includes original articles, reviews and notices.

News in Brief

The University of Aberdeen has conferred the honorary degree of LL.D. on Dr. G. C. Simpson, F.R.S.

Dr. H. Jeffreys, Fellow and Lecturer of St. John's College, Cambridge, has been recommended by the Council for election into the Royal Society.

Dr. Jeffreys will give a lecture on "The Cooling of the Earth" at the meeting of the London Mathematical Society, to be held in the rooms of the Royal Astronomical Society, Burlington House, on April 23rd, at 5 p.m.

Mr. C. T. R. Wilson, F.R.S. has been elected to the Jacksonian professorship of natural philosophy, Cambridge. Whilst realising that Prof. Wilson's high reputation does not depend only on his work in atmospheric electricity, we are gratified to learn of this recognition by one of the older universities of the importance of a branch of meteorology.

The Sixth Annual Soirée of the Meteorological Office Staff was held on Friday, February 20th, at Australia House, London. A gathering of 250 people enjoyed a programme of music and dancing, with a comedy sketch produced by the staff of the Climatology Division. The attendance of the provincial staff was particularly gratifying, members being present from stations as widely separated as Sealand, Porton, Calshot, Andover and Felixstowe. Mr. H. W. W. McAnally, C.B., Principal Assistant Secretary of the Air Ministry, was among the guests.

The Weather of February, 1925

THE unsettled weather which had prevailed in the British Isles from January 22nd continued throughout the greater part of February, and the rainfall and mean temperature were generally above the normal for the month. During the first six days the centres of the depressions passed well to the northward of the British Isles, and high winds and gales occurred at times in a few exposed places. Showers of rain, hail or snow were recorded on most of these days, as much as 32 mm. (1·24 in.) being registered at Castle Lough (Tipperary) on the 3rd, but there were many bright periods. On the 7th, under the influence of a ridge of high pressure which moved quickly across England, sunshine records exceeded 8 hrs. in several districts of southern England, but the approach of fresh disturbances from the Atlantic caused a renewal of unsettled weather in Ireland on the evening of the

7th. These conditions spread later over the whole country, and continued until the 16th. Heavy rain fell on the 10th, 11th and 12th, *e.g.*, 82 mm. (3·23 in.) were reported from Snowdon (Carnarvon) and 38 mm. (1·50 in.) from Arkengarthdale (Yorkshire) on the 10th, and 39 mm. (1·55 in.) from Newport (Isle of Wight) on the 12th. Floods occurred in many parts of northern England. Gales were recorded on several days, a velocity of 78 m.p.h. being attained in a gust at Valencia on the 9th and Shoeburyness on the 11th. During the third week the weather became colder, quieter, and somewhat fairer. From 8 to 9 hrs. bright sunshine was experienced in many parts of the kingdom between the 18th and 22nd, but snow, sleet and rain showers occurred generally and snow lying to a depth of 6 in. was reported from Crieff (Perth) on the 21st. Maximum temperatures of 35° F. or below were recorded at a few places in northern England and Scotland on the 22nd to 24th, *e.g.*, 32° F. at Eskdalemuir on the 22nd and 35° F. at Harrogate on the 23rd. A depression approaching from the Atlantic caused high winds and unsettled weather in Ireland on the 22nd, and these conditions spread by the 24th to the rest of the kingdom. The heaviest rainfall was recorded on the 25th when 62 mm. (2·45 in.) fell at Llyn Fawr (Glamorgan) and 38 mm. (1·48 in.) at Dormans Park (Surrey). Floods were reported from the Thames Valley and many parts of Kent. The centre of this low pressure system to the west of Ireland gradually became deeper until on the 26th pressure fell below 970 mb. in many districts of the British Isles as the centre passed to the north of England. Subsequently it began to fill up and in several parts of southern England the brightest weather of the month was experienced on the 28th.

The total rainfall for the month was well above the average for most districts, being as much as 262 per cent. of the average at Llandudno, Carnarvon, 242 per cent. at Bradford, Yorkshire, and 240 per cent. at Ovington Rectory, Hampshire.

In February pressure was more than 10 mb. below normal over the British Isles, the shores of the North Sea, Denmark and southern Scandinavia. Over the Azores pressure was 10 mb. above normal and a wedge of high pressure extended northwards towards Greenland. This distribution was associated with frequent deep depressions which passed very slowly across these islands giving strong and stormy westerly and south-westerly winds. Much damage was done to shipping at the Icelandic fishing grounds and in the Bay of Biscay. Over south-western Europe the prevailing winds were more southerly. Gales were experienced in Austria, eastern Switzerland and northern Italy between the 13th and 16th. On the Salzburg-Ischl line a passenger train was blown over an embankment near St. Gilgen.

Heavy falls of snow occurred during the same period in the Lombardy Alps, and in Switzerland where much damage has been caused by avalanches in the Ticino Canton. The rainfall over western Europe was generally slightly below normal except in Sweden where precipitation, mostly snow, was slightly above normal. In western Turkey the rainfall was for the third month in succession very scanty and the crops are suffering.* Temperature was much above normal the excess being 5° F. at Zürich, 8° F. at Stockholm, 10° F. at Haparanda, and 14° F. at Spitsbergen. Between the 19th and 25th however there was a cold period in Sweden, —33° F. being recorded at Karesuando on the 24th. The ice conditions at Spitsbergen are unusual for the time of year, the islands are free of ice and the fjords are open. Thunderstorms were unusally frequent in southern Sweden early in the month.

Crops over the whole of south-eastern and south-central Africa are suffering from the results of the heavy rains, and floods have occurred on the Zambesi and Pungwe rivers causing a stoppage on the Beira-Zambesi and Nyasaland Railways. The Zambesi rose beyond the limit of the 1918 flood. A severe hailstorm was reported from Elliot towards the end of the month. Morocco has also suffered from heavy rains.

A heavy rainstorm beyond Arequipa washed away some six miles of track on the Southern Railway of Peru. In Canada the temperature was very low at times, *e.g.* —48° F. was registered at White River, Ontario, on the 2nd.

In Queensland and South Australia heavy rains occurred during the early part of the month. At Adelaide 5 in. of rain fell in 2 hours on the 6th, the worst rainstorm experienced there for 86 years. There was a change to very hot weather at Brisbane towards the end of the month.

Gales occurred off the Japanese coast on the 24th.

The special message from Brazil states that the rainfall in the central and southern regions was scanty, being 93 mm. and 85 mm. below normal respectively. No reports were received from the north. Owing to the South Atlantic anticyclone extending nearer to South America than usual there were long spells of fine dry weather. Few depressions passed across the country. The crops were generally affected by the small rainfall in the middle of the wet season. At Rio de Janeiro pressure was ·5 mb. above normal and the temperature normal.

Rainfall January, 1925—General Distribution

England and Wales ..	189	per cent. of the average 1881-1915.
Scotland	159	
Ireland	155	
British Isles	174	

*see page 35

Rainfall: February, 1925: England and Wales

CO.	STATION.	In.	mm.	Per-cent. of Av	CO.	STATION.	In.	mm.	Per-cent. of Av.
Lond.	Camden Square.......	2·86	73	171	*War.*	Birminghm, Edgbaston	2·94	75	174
Sur .	Reigate, Hartswood...	4·53	115	221	*Leics*	Thornton Reservoir ..	3·06	78	183
Kent.	Tenterden, View Tower	3·85	98	195	,, .	Belvoir Castle........	2·43	62	146
,, .	Folkestone, Boro. San.	3·56	91	...	*Rut* .	Ridlington...........	2·44	62	...
,, .	Broadstairs, St Peter's	2·21	56	149	*Linc.*	Boston, Skirbeck.....	1·91	49	131
,, .	Sevenoaks, Speldhurst.	4·39	111	...	,, .	Lincoln, Sessions House	1·66	42	114
Sus .	Patching Farm.......	4·22	107	191	,, .	Skegness, Estate Office.	2·00	51	131
,, .	Brighton, Old Steyne .	4·57	116	234	,, .	Louth, Westgate	2·47	63	129
,, .	Tottingworth Park....	4·67	119	199	,, .	Brigg	2·21	56	128
Hants	Ventnor, Roy.Nat.Hos.	4·54	115	216	*Notts.*	Worksop, Hodsock....	2·21	56	143
,, .	Fordingbridge, Oaklnds	5·35	143	227	*Derby*	Mickleover, Clyde Ho..	2·90	74	176
,, .	Ovington Rectory	6·23	158	240	,, .	Buxton, Devon. Hos...	7·58	193	202
,, .	Sherborne, St.JohnRec.	3·96	101	181	*Ches.*	Runcorn, Weston Pt...	4·69	119	252
Berks	Wellington College...		..	...	,, ..	Nantwich, Dorfold Hall	4·01	102	...
,, .	Newbury, Greenham..	4·63	118	210	*Lancs*	Manchester, Whit. Pk.	5·00	127	260
Herts.	Bennington House....	3·07	78	193	,, ..	Stonyhurst College....	5·86	149	175
Bucks	High Wycombe	3·64	93	197	,, ..	Southport, Hesketh...	4·18	106	199
Oxf..	Oxford, Mag. College..	3·42	87	216	,, ..	Lancaster, Strathspey.	5·48	139	...
Nor .	Pitsford, Sedgebrook..	2·79	71	167	*Yorks*	Sedbergh, Akay	8·59	218	194
,, .	Eye, Northolm........	1·55	39	...	,, .	Wath-upon-Dearne ...	2·98	76	182
Beds.	Woburn, Crawley Mill.		..	...	,, .	Bradford, Lister Pk...	5·66	144	242
Cam.	Cambridge, Bot. Gdns.	2·45	62	191	,, .	Wetherby, Ribston H..	3·92	100	227
Essex	Chelmsford, CountyLab	2·26	57	153	,, .	Hull, Pearson Park ...	1·93	49	116
,, .	Lexden, Hill House...	1·97	50	...	,, .	Holme-on-Spalding ...	3·42	87	...
Suff.	Hawkedon Rectory ...	2·90	74	191	,, .	West Witton, Ivy Ho..	5·40	137	...
,, .	Haughley House......	1·88	48	...	,, .	Felixkirk, Mt. St. John	3·21	81	190
Norf.	Beccles, Geldeston....	1·85	47	135	,, .	Pickering, Hungate ...	3·06	78	...
,, .	Norwich, Eaton	2·03	52	124	,, .	Scarborough.........		..	...
,, .	Blakeney	2·46	63	166	,, .	Middlesbrough	2·31	59	178
,, .	Swaffham	2·73	69	174	,, .	Baldersdale, Hury Res.	5·43	138	176
Wilts.	Devizes, Highclere....	4·21	107	213	*Durh.*	Ushaw College	2·45	62	154
,, .	Bishops Cannings	4·09	104	193	*Nor* .	Newcastle, Town Moor.	2·66	68	167
Dor .	Evershot, Melbury Ho.	5·07	129	161	,, .	Bellingham Manor....	5·36	136	...
,, .	Weymouth, Westham..	3·99	101	185	,, .	Lilburn Tower Gdns...	6·05	154	...
,, .	Shaftesbury, Abbey Ho.	3·75	95	162	*Cumb*	Geltsdale...........	5·35	136	...
Devon	Plymouth, The Hoe...	3·85	98	133	,, .	Carlisle, Scaleby Hall .	4·82	123	216
,, .	Polapit Tamar	7·47	190	233	,, .	Seathwaite M........	16·60	422	140
,, .	Ashburton, Druid Ho..	7·53	191	159	*Glam.*	Cardiff, Ely P. Stn.....	6·27	159	209
,, .	Cullompton	5·33	135	191	,, .	Treherbert, Tynywaun	16·54	420	...
,, .	Sidmouth, Sidmount ..	3·93	100	157	*Carm*	Carmarthen Friary....	7·96	202	215
,, .	Filleigh, Castle Hill ...	7·20	183	...	,, .	Llanwrda, Dolaucothy.	11·10	282	255
,, .	Barnstaple, N.Dev.Ath.	6·18	157	228	*Pemb*	Haverfordwest, School	6·98	177	201
Corn.	Redruth, Trewirgie ...	7·26	184	192	*Card.*	Gogerddan..........	9·08	231	286
,, .	Penzance, Morrab Gdn.	5·59	142	167	,, .	Cardigan, County Sch. .	6·61	168	...
,,	St. Austell, Trevarna..	7·15	182	186	*Brec.*	Crickhowell, Talymaes	8·50	216	...
Soms	Chewton Mendip	6·75	171	200	*Rad* .	Birm. W. W. Tyrmynydd	12·08	307	230
,, .	Street, Hind Hayes ...	3·53	90	...	*Mont.*	Lake Vyrnwy	9·69	246	214
Glos..	Clifton College	3·97	101	168	*Denb.*	Llangynhafal	4·61	117	...
,, .	Cirencester	4·16	106	179	*Mer* .	Dolgelly, Bryntirion..	10·01	254	225
Here.	Ross, Birchlea	4·17	106	207	*Carn.*	Llandudno	5·44	138	262
,, .	Ledbury, Underdown.	3·47	88	191	,, .	Snowdon, L. Llydaw 9	20·63	524	...
Salop	Church Stretton......	4·77	121	217	*Ang* .	Holyhead, Salt Island.	5·29	134	217
,, .	Shifnal, Hatton Grange	3·27	83	202	,, .	Lligwy	5·62	143	...
Staff.	Tean, The Heath Ho...	4·32	110	215	*Isle of Man*				
Worc.	Ombersley, Holt Lock.	2·68	68	163		Douglas, Boro' Cem...	5·00	127	153
,, .	Blockley, Upton Wold.	4·56	116	201	*Guernsey*				
War.	Farnborough.........	4·07	103	198		St. Peter P't, Grange Rd	3·93	100	160

Seathwaite, Monthly, January, 13.70 inches, 348 mm.

Rainfall : February, 1925 : Scotland and Ireland

CO.	STATION	In.	mm.	Per-cent. of Av.	CO.	STATION.	In.	mm.	Per-cent. of Av.
Wigt.	Stoneykirk, Ardwell Ho	4·14	105	158	*Suth.*	Loch More, Achfary	10·47	266	159
,,	Pt. William, Monreith	4·78	121	...	*Caith*	Wick	3·04	77	134
Kirk.	Carsphairn, Shiel.	10·83	275	...	*Ork*	Pomona, Deerness	3·80	97	126
,,	Dumfries, Cargen	6·11	155	157	*Shet.*	Lerwick	6·29	160	199
Dum	Drumlanrig	5·33	135	140	*Cork.*	Caheragh Rectory	7·50	191	...
Roxb	Branxholme	5·10	129	194	,,	Dunmanway Rectory	6·57	167	112
Selk.	Ettrick Manse	7·97	203	...	,,	Ballinacurra	3·46	88	93
Berk.	Marchmont House	5·28	134	254	,,	Glanmire, Lota Lo.	4·95	126	125
Hadd	North Berwick Res.	3·42	87	219	*Kerry*	Valencia Obsy.	7·78	198	150
Midl	Edinburgh, Roy. Obs.	3·53	90	226	,,	Gearahameen	13·90	353	...
Lan.	Biggar	5·04	128	211	,,	Killarney Asylum	6·60	168	126
Ayr.	Kilmarnock, Agric. C.	3·18	81	111	,,	Darrynane Abbey	7·59	193	164
,,	Girvan, Pinmore	6·27	159	147	*Wat.*	Waterford, Brook Lo.		..	...
Renf.	Glasgow, Queen's Pk.	3·76	95	128	*Tip.*	Nenagh, Cas. Lough	5·95	151	191
,,	Greenock, Prospect H.	5·33	135	95	,,	Tipperary	4·89	124	...
Bute.	Rothesay, Ardencraig	3·73	95	93	,,	Cashel, Ballinamona	4·27	109	133
,,	Dougarie Lodge	6·29	160	...	*Lim.*	Foynes, Coolnanes	5·85	149	183
Arg.	Ardgour House	8·56	217	...	,,	Castleconnell Rec.	6·39	162	...
,,	Manse of Glenorchy	6·77	172	...	*Clare*	Inagh, Mount Callan	10·26	261	...
,,	Oban	4·39	111	...	,,	Broadford, Hurdlest'n.	6·89	175	...
,,	Poltalloch	4·59	117	110	*Wexf*	Newtownbarry	5·12	130	...
,,	Inveraray Castle	7·32	186	108	,,	Gorey, Courtown Ho.	4·07	103	145
,,	Islay, Eallabus	5·38	137	128	*Kilk.*	Kilkenny Castle	4·89	124	192
,,	Mull, Benmore	...	..	...	*Wic.*	Rathnew, Clonmannon	3·65	93	...
Kinr.	Loch Leven Sluice	4·10	104	145	*Carl.*	Hacketstown Rectory	5·17	131	172
Perth	Loch Dhu	8·70	221	117	*QCo.*	Blandsfort House	4·98	127	186
,,	Balquhidder, Stronvar	6·21	158	87	,,	Mountmellick	4·62	117	...
,,	Crieff, Strathearn Hyd.	4·71	120	134	*KCo.*	Birr Castle	5·26	134	230
,,	Blair Castle Gardens	5·14	131	184	*Dubl.*	Dublin, FitzWm. Sq.	3·96	101	210
,,	Coupar Angus School	3·44	87	162	,,	Balbriggan, Ardgillan	3·79	96	193
Forf.	Dundee, E. Necropolis	3·25	83	173	*Me'th*	Drogheda, Mornington	3·54	90	...
,,	Pearsie House	5·55	141	...	,,	Kells, Headfort	3·79	96	140
,,	Montrose, Sunnyside	3·22	82	175	*W.M*	Mullingar, Belvedere	4·46	113	160
Aber.	Braemar Bank	6·37	162	233	*Long*	Castle Forbes Gdns.	3·62	92	127
,,	Logie Coldstone Sch.	6·60	168	317	*Gal*	Ballynahinch Castle	7·64	194	149
,,	Aberdeen, Cranford Ho	...	..	...	*Mayo*	Mallaranny	8·14	207	...
,,	Fyvie Castle	4·90	125	...	,,	Westport House	6·07	154	154
Mor.	Gordon Castle	3·40	86	177	,,	Delphi Lodge	11·99	305	...
,,	Grantown-on-Spey	5·65	143	266	*Sligo*	Markree Obsy.	4·49	114	131
Na	Nairn, Delnies	2·66	68	148	,,	Sligo, Ard-na-veagh	3·89	99	...
Inv.	Ben Alder Lodge	7·27	185	...	*Cav'n*	Belturbet, Cloverhill	3·70	94	142
,,	Kingussie, The Birches	6·07	154	...	*Ferm*	Enniskillen, Portora	4·90	125	...
,,	Loch Quoich, Loan	12·00	305	...	*Arm.*	Armagh Obsy.	3·57	91	161
,,	Glenquoich	9·84	250	95	*Down*	Warrenpoint	3·75	95	...
,,	Inverness, Culduthel R.	4·51	115	...	,,	Seaforde	3·79	96	124
,,	Arisaig, Faire-na-Squir	4·25	108	...	,,	Donaghadee	4·18	106	182
,,	Fort William	8·27	210	111	,,	Banbridge, Milltown	2·81	71	135
,,	Skye, Dunvegan	5·15	131	...	*Antr.*	Belfast, Cavehill Rd.	4·13	105	...
,,	Barra, Castlebay	2·46	63	...	,,	Glenarm Castle	·	..	...
R&C	Alness, Ardross Cas.	6·92	176	210	,,	Ballymena, Harryville	3·72	95	115
,,	Ullapool	5·07	129	...	*Lon.*	Londonderry, Creggan	5·47	139	171
,,	Torridon, Bendamph	9·87	251	98	*Tyr.*	Donaghmore	4·16	106	...
,,	Achnashellach	7·74	197	...	,,	Omagh, Edenfel	5·09	129	171
,,	Stornoway	5·38	137	121	*Don.*	Malin Head	3·86	98	160
Suth.	Lairg	5·49	139	...	,,	Rathmullen	5·50	140	...
,,	Tongue Manse	5·21	132	149	,,	Dunfanaghy	·	..	...
,,	Melvich School	3·88	99	130	,,	Killybegs, Rockmount	5·85	149	117

Climatological Table for the British Empire, September, 1924

STATIONS	PRESSURE Mean of Day M.S.L. mb.	PRESSURE Diff. from Normal mb.	TEMPERATURE Absolute Max. °F.	Absolute Min. °F.	Mean Values Max. °F.	Mean Values Min. °F.	Mean Values ½ max. and min. °F.	Mean Values Diff. from Normal °F.	Mean Wet Bulb. °F.	Relative Humidity %	Mean Cloud Am'nt 0—10	PRECIPITATION Am'nt mm.	PRECIPITATION Diff. from Normal mm.	PRECIPITATION Days	BRIGHT SUNSHINE Hours per day	BRIGHT SUNSHINE Percentage of possible.
London, Kew Obsy.	1010·9	− 6·5	72	41	63·6	52·0	57·8	+ 0·7	54·7	80	7·5	75	+ 27	19	3·9	31
Gibraltar	1016·8	− 0·5	86	61	78·5	65·6	72·1	− 0·4	65·3	71	4·4	0	− 35	0	...	...
Malta	1016·5	+ 0·8	102	67	86·2	74·1	80·1	+ 4·9	71·6	69	1·5	1	− 29	2	9·4	75
Sierra Leone	1013·5	+ 0·9	87	68	82·7	70·2	76·5	− 2·7	74·3	86	7·7	827	+102	29	...	...
Lagos, Nigeria	1011·8	− 1·0	86	72	84·6	74·3	79·5	+ 1·4	75·5	77	5·8	104	− 26	12	...	...
Kaduna, Nigeria	1016·1	+ 3·3	88	67	83·6	68·9	76·3	+ 1·0	71·9	89	0·9	235	− 25	25	...	...
Zomba, Nyasaland	1013·5	− 0·3	89	46	82·7	58·8	70·7	+ 1·6	...	77	3·1	0	− 9	0	...	...
Salisbury, Rhodesia	1013·3	− 1·4	90	37	81·7	51·9	66·8	+ 0·6	54·0	42	1·7	0	− 8	0	...	...
Cape Town	1018·8	− 0·3	75	42	65·5	52·2	58·9	+ 1·0	55·0	71	4·4	35	− 22	11	...	...
Johannesburg	1018·3	+ 0·3	82	26	69·4	47·7	58·5	− 0·8	46·6	55	2·4	35	+ 11	7	8·6	72
Mauritius	1020·0	− 0·2	80	54	75·9	61·7	68·8	− 1·3	62·6	70	5·5	27	− 6	8	7·9	67
Bloemfontein	...	...	88	27	72·4	42·3	57·3	− 1·8	46·5	54	3·1	42	+ 19	6	...	...
Calcutta, Alipore Obsy.	1006·2	+ 1·7	91	76	88·1	78·6	83·3	+ 0·3	79·2	88	7·8	250	− 13	13*	...	...
Bombay	1006·9	− 1·1	89	74	85·2	76·9	81·1	+ 0·4	76·5	88	8·9	308	+ 33	18*	...	...
Madras	1006·5	0·0	99	73	90·5	76·5	83·5	− 1·6	77·3	80	6·0	246	+115	11*	...	...
Colombo, Ceylon	1009·4	− 0·2	87	73	85·2	76·3	80·7	− 0·7	77·4	77	8·8	381	+255	21	4·5	37
Hong Kong	1009·1	+ 0·8	93	74	86·8	78·6	82·7	+ 1·7	77·0	78	6·3	164	− 82	13	7·4	60
Sandakan	...	...	92	70	88·7	74·5	81·6	− 0·1	76·5	77	...	200	− 39	15	...	...
Sydney	1015·1	− 0·9	82	45	69·4	52·1	60·7	+ 1·7	53·9	63	5·0	71	− 3	13	6·2	52
Melbourne	1014·5	− 1·3	76	40	61·7	48·2	54·9	+ 0·8	50·9	70	7·8	58	− 3	23	3·9	33
Adelaide	1015·9	− 1·6	77	40	64·1	48·5	56·3	− 0·7	51·5	69	7·1	88	+ 38	21	4·5	35
Perth, W. Australia	1017·8	− 0·1	81	42	66·9	50·2	58·5	+ 0·4	53·2	69	4·7	57	− 28	13	7·3	62
Coolgardie	1016·7	− 0·4	87	39	71·7	47·6	59·7	+ 1·1	51·8	41	3·9	23	+ 8	5	...	...
Brisbane	1017·9	+ 0·8	84	49	75·7	56·6	66·1	+ 0·8	61·4	66	3·3	30	− 22	8	8·3	70
Hobart, Tasmania	1009·1	− 1·6	66	38	58·3	44·4	51·3	+ 0·5	46·9	71	7·0	43	− 11	20	3·8	32
Wellington, N.Z.	1018·9	+ 5·4	67	35	59·4	49·2	54·3	+ 2·8	50·4	76	6·1	62	− 37	11	4·9	41
Suva, Fiji	1015·2	+ 0·9	83	65	77·7	68·7	73·2	− 1·3	69·7	79	7·5	428	+251	22	...	...
Apia, Samoa	1010·3	− 1·8	89	69	84·7	73·4	79·0	+ 1·1	75·7	86	4·2	97	− 39	12	8·3	69
Kingston, Jamaica	1012·0	− 0·2	92	68	88·1	72·6	80·3	− 1·2	74·7	78	7·6	262	+158	16	...	...
Grenada, W.I.	1013·1	+ 1·3	89	72	85·4	75·4	80·4	+ 0·2	76·3	77	5·6	128	− 77	20	...	...
Toronto	1017·9	+ 0·1	81	38	65·5	48·5	57·0	− 2·2	50·9	77	5·3	105	+ 24	12	5·6	45
Winnipeg	1015·3	+ 0·5	85	28	65·9	42·8	54·3	+ 0·9	49·0	80	4·7	92	+ 42	9	6·5	51
St. John, N.B.	1018·0	+ 0·5	69	38	61·9	48·0	54·9	− 1·0	51·9	84	5·0	65	− 30	12	5·9	47
Victoria, B.C.	1014·8	− 1·7	81	43	65·0	49·5	57·3	+ 1·7	51·5	79	4·0	57	+ 6	6	7·6	60

* For Indian stations a rain day is a day on which 0·1 in. (2·5 mm.) or more rain has fallen.

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